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# Technical Report on the Potential Impacts on Business Revenues during Construction of the Central Corridor Light Rail Project

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# 1.0 Introduction

This report will investigate the impacts to business revenues along the Central Corridor resulting from the construction of the Central Corridor Light Rail Project (“Project”). It is prepared in response to the District Court’s January 26, 2011 opinion issued in *NAACP et al v. USDOT*,<sup>1</sup> in which the Court held that the Final Environmental Impact Statement (“FEIS”) did not evaluate potential impacts on the loss of business revenue during construction and that it should have been evaluated during the National Environmental Policy Act (“NEPA”) process. This study will address the potential loss of revenue by local businesses during the construction period for the Project. This report will classify the businesses that abut the alignment, identify the potential environmental impacts caused by the construction of the project, and attempt to quantify the potential average loss of revenue for small businesses, to the extent that such potential losses can be quantified.

It is important to note that there is a dearth of information available that provides a reliable methodology for quantifying potential business losses caused by construction of a project like the Central Corridor Project. We undertook an exhaustive review of the literature, searching the largest online bibliographic database of transportation research and working with research librarians in government and a major research university and were only able to find four prior studies since 1990 that used objective data to attempt to quantify the construction impacts on businesses that abut the construction of transportation alignments. These studies, which are set forth in more detail in Table 1, reflect a range of impacts on business revenues, from positive impacts to larger negative impacts on discrete market segments. These studies also reflect that some businesses may show an increase in revenues likely due to receiving business from construction workers. None of the studies reviewed provided an “apples to apples” comparison, with each study reflecting projects of different sizes and scope, construction duration, and construction staging options. Moreover, what is clear from reviewing the studies is that numerous factors other than construction can impact a business’ revenues, including external economic factors, unemployment rates, and world events. The ability to control for these external factors is limited. Indeed, based on the experience of the businesses along the Central Corridor between 2009 and 2011, the number of vacancies increased from 126 to 193.<sup>2</sup>

## 2.0 Methodology

### 2.1 Framework

The analysis has two parts:

- Development of a set of environmental impact categories during construction that would have a potential adverse impact on business revenues

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<sup>1</sup> *NAACP, et al. v. US Department of Transportation, et. al.*, CIV 10-147 (W.D. MN, UNPUBLISHED DECISION, January 26, 2011).

<sup>2</sup> Business census data of the Central Corridor from the Metropolitan Council. E-mail 2/23/11 from Robin Cauffman.

- An assessment of the environmental impacts of construction on business revenues<sup>3</sup>

The output of the analysis is a qualitative analysis of how business revenues may be impacted by construction and a quantitative *estimate* of the potential losses on average businesses may experience during construction. We cannot to any reliable degree project the potential loss of revenues due solely to the construction of the project for any specific business. At best, we can identify, based on prior studies, discrete market segments that may in the aggregate be more sensitive to revenue fluctuations when stressed by outside economic factors that include construction of a major transportation project adjacent to the business.

### 2.1.1 Impact Categories

The Minnesota Department of Transportation's February 2009 report, *Mitigation of Transportation Construction Impacts* ("MnDOT Report"), was the starting point for the development of impact categories. The report, required by Minnesota law, surveyed business owners recently affected by highway construction projects to determine the greatest impacts on the businesses and the most successful mitigation practices.<sup>4</sup> The businesses named loss of access, highway or road closures, detours, reduced traffic, poor signing, and project length as major impacts, as well as congestion resulting from lane closures, lost parking leading to avoidance of the construction area (and surrounding businesses), and property damage resulting from contractor actions.

Because the MnDOT Report focused mainly on highway construction projects, the analysis presented in this study also considered Environmental Impact Statements (EIS) from four light rail projects that are either constructed or in the final design phase: Portland's light rail link to Milwaukie, scheduled to be finished in 2015; Dallas's Green Line (the DART Project), already operating as of December 2010; and two projects in Seattle, the East Link and the North Link, scheduled to open in 2016. All of the projects except the DART Project have some stretch of the corridor operating along a retail street. In the EIS reviews, the major impacts considered were access to businesses, traffic impacts, noise and vibration, temporary loss of parking, increased dirt and dust, visual impacts, and utility shutoffs. These environmental reviews did not attempt to quantify the effect these impacts would have on the potential loss of business revenues during construction.

From the sources noted above, the following impact categories were derived:

- Pedestrian access
- Traffic and vehicular access
- Temporary parking loss
- Utility shutoffs
- Noise and vibration
- Increased dirt and dust
- Visual impacts

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<sup>3</sup> Note that reliance on estimation methods that use sales tax revenue will only be able to detect sales revenue impacts on items that are taxed in the places that were studied.

<sup>4</sup> CH2MHill for the Minnesota Department of Transportation, "Report on Mitigation of Transportation Construction Impacts". Final Report. February 2009.

### **2.1.2 Impacts of construction on sales revenues**

Few studies have attempted to quantify specific values for loss of revenue associated with construction, and the identified studies focus on the impacts of highway construction rather than transit. In addition, the quantified impacts vary with the context of the project, so there is not a single point estimate on which all agree. With the current state of knowledge about construction impacts on business revenues, developing reliable point estimates of such transit construction impacts is infeasible to implement on a project-level analysis. To develop an estimate of construction impacts on a project-level foundation, it is necessary to have a reliable estimate of current and future revenues for specific businesses, and then adjust that estimate by the change in business resulting from the construction absent other economic or social factors. Difficulties in estimating future revenues include: accurately predicting the overall state of the economy and how it affects businesses in the construction zone, predicting local changes in socio-economic characteristics, anticipating other local changes that would affect traffic or business patterns (such as the opening or closing of competing businesses outside the construction zone), anticipating other technology or behavioral changes that could affect businesses in each industry (such as the downsizing of businesses due to technological advances in the business function), and anticipating force majeure impacts (e.g. “acts of nature”) to businesses. As a result, predicting the amount of lost business revenue for any given business or market segment is highly uncertain and speculative. Business forecasts generally are not done for corridors for this reason, even under ordinary circumstances, let alone when business is disrupted by a construction project.

Table 1 presents estimates of construction impacts on business revenues drawn from studies in the literature. These studies were identified through a comprehensive literature search to identify studies that were completed since 1990 and used objective methods to measure construction impacts on sales revenues, such as analyzing sales tax revenue of businesses during construction. The construction projects analyzed were all highway projects, with measures taken to minimize disruption. Moreover, the highway projects varied significantly from the Central Corridor project in terms of construction complexity, duration, construction staging options, geographic constraints and construction seasons, all of which can contribute to the impact of construction on a given business’ revenues.

**Table 1. Recent quantitative studies of construction sales revenue impacts on businesses**

Study	Context of construction	Magnitude of impact
<b>Buddemeyer, Young and Vander Giessen (2008)</b> <sup>5</sup>	Highway reconstruction near Dubois, Wyoming on the way to Jackson Hole and Yellowstone National Park	No impact: “holding steady with minor declines”
<b>De Solminihac and Harrison (1993)</b> <sup>6</sup>	Houston urban highway rehabilitation, including High Occupancy Vehicles (HOV) lanes and a transit center	General merchandise: 28% decrease Food stores: 37% decrease Automotive outlets: 32% decrease Home furnishings: 17% decrease
<b>Wildenthal and Buffington (1996)</b> <sup>7</sup>	Widening a state highway in Caldwell, TX (population 3000)	5% decrease
<b>Young, Wolffing, and Tomasini (2005)</b> <sup>8</sup>	Twelve highway construction projects in Wyoming in towns ranging in size from 807 to 53,011 people	8.3% decrease to 39.9% increase

The studies ranged in sophistication of analytical techniques. For instance, Buddemeyer, Young and Vander Giessen provided summary statistics of sales data, while De Solminihac and Harrison tried to control for other effects on revenues through advanced statistical methods. They estimated average impacts of construction on sales tax revenues by comparing to businesses in a similar location during the same time period. Even with the more sophisticated method, these average impacts do not provide good predictions of sales revenue impacts for any particular business, because businesses experienced both greater and lesser impacts, with only the average presented. The average is presented with a confidence interval that lets the reader interpret how sure the authors are. For instance, De Solminihac and Harrison used a confidence level of 90% in their analysis to conclude that there were no sales revenue impacts for building materials, clothing, restaurants, drug stores, liquor stores, and “miscellaneous”. Consequently, the average sales revenue impact was sufficiently small that the study could not distinguish it from zero. This occurs when there are businesses in the category that have increased sales and others with decreased sales. For example, if sales at sandwich shops increase and sales at formal restaurants decrease, the overall category of restaurants could show on average no effect.

<sup>5</sup> Buddemeyer, Jenna, Rhonda Young and Steven Vander Giessen, “Highway Construction Related Business Impacts: Phase 3 Effort for the Town Of Dubois”. FHWA-WY-08/01F. March 2008: <http://rip.trb.org/browse/dproject.asp?n=11090>.

<sup>6</sup> De Solminihac, Hernan E. and Robert Harrison, “Analyzing Effects of Highway Rehabilitation on Businesses” Transportation Research Record 1395, Transportation Research Board of the National Academies, Washington, D.C., 1993, pp 137-143.

<sup>7</sup> Wildenthal, MT and Buffington, “Estimated Construction Period Impact of Widening State Highway 21 in Caldwell, Texas” Transportation Research Record 1559, Transportation Research Board of the National Academies, Washington, D.C., 1996, pp 76-83.

<sup>8</sup> Young, Rhonda Kae, Chris Wolffing, and Michael Tomasini, “Highway Construction Impacts on Wyoming Businesses” *Transportation Research Record: Journal of the Transportation Research Board*, No. 1924, Transportation Research Board of the National Academies, Washington, D.C., 2005, pp. 94–102.

Considering the complexities of using information from the literature, the analysis used in this report applied the estimates of impacts provided by one study to estimate the upper bound of effects of the Project on sales revenues of impacted businesses. The source used was De Solminihac and Harrison (1993) because the context was the most analogous to the Central Corridor Project. The project reviewed in the De Solminihac and Harrison study was in a major urban area with a variety of options for consumers to switch their business away from the construction corridor based on the environmental impacts caused by construction. It included some transit elements (bus transitway) as part of major work on a busy urban highway. The business mix on that corridor is weighted differently than the CCLRT corridor but includes the same categories of business.

The estimates provided by the other three studies in Table 1 were used to support a predicted lower bound of no effect since the business contexts for those construction projects would tend to lead to the economic stimulus effects of construction spending outweighing the disruptive effects on businesses of the construction itself. The projects were in much smaller towns whose economies are more rural and reliant more on tourism, in some cases. A critical consideration is that these towns also were likely to have fewer options for consumers to choose alternative businesses if they were disrupted by the environmental impacts of construction. The percentage impacts from De Solminihac and Harrison (1993) are applied to revenue data from a July 2010 business survey by the U-Plan community planning studio to develop the upper bound revenue loss by business type.<sup>9</sup> For the calculation of sales revenue impacts, the categories are consolidated to reflect the way business categories are aggregated in the previous studies. These categories reflect differences in potential sales revenue impacts by business category, but are not tied directly to the qualitative impacts that will be described. No attempt was made to adjust the impacts for seasonal factors because of the inherent uncertainty in the estimates and lack of information to attempt to adjust for seasonal patterns in revenue in conjunction with fluctuating levels of construction activity through the seasons.

Estimates of the numbers of small businesses affected are presented in this report. Small businesses are defined as those with annual revenues less than \$2 million. The percentage impacts from De Solminihac and Harrison (1993) are applied to annual revenues of small businesses in the corridor to generate an upper bound sales weighted average overall impact estimate for small businesses.

## **2.2 Data**

In order to identify small businesses along the corridor, the dataset assembled by U-Plan (a community planning studio located on the corridor) was utilized (“U-Plan Dataset”). The U-Plan Dataset initially consisted of 1,410 entities that were located on University Avenue and Washington Avenue in July 2010. U-Plan validated the data against lists from the University Avenue Business Association, Asian Economic Development Association, and the University of Minnesota capstone project. The validation effort resulted in 1,272 businesses in December of 2010, compiled with annual revenue as well as a GIS data point based on the business address. The U-Plan Dataset does not include downtown St. Paul and Minneapolis and is not limited to

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<sup>9</sup> U-PLAN Community Studio, “University Avenue Business List, July 2010” 712 University Avenue, Suite 105 Saint Paul, MN 55104 adam@u-plan.org

businesses adjacent to the alignment. There were 947 businesses with revenue in the dataset along the construction alignment.

## 2.2 Description of businesses

The Central Corridor has a diverse economy with nearly all of the NAICS codes represented along it.<sup>10</sup> Table 2 shows the breakdown of businesses along the corridor by the categories used in De Solminihac and Harrison (1993), including the percentage with revenues less than \$2 million per year. Overall, the majority of businesses in the corridor are small businesses with revenues less than \$2 million per year.

**Table 2. Sector composition of the Central Corridor**

Business Type	Number of Businesses	Percent with Annual Revenue Less than \$2 million	Number of Businesses with Revenue Less than \$2 million
<b>Food Stores</b>	25	76%	19
<b>General Merchandise</b>	6	33%	2
<b>Furniture Stores</b>	3	100%	3
<b>Automotive Retail</b>	53	81%	43
<b>All Other Businesses</b>	860	85%	731
<b>TOTAL BUSINESSES</b>	947	84%	798

Food stores include supermarkets, convenience stores, liquor stores, and meat markets. Along the Central Corridor, the general merchandise stores are mainly national chains. Automotive retail includes both new and used car and truck dealers, tire and auto parts stores, and auto repair stores. All other businesses include manufacturing establishments, specialty stores, restaurants, personal care services, and professional services like architects and lawyers.

## 3.0 Results

### 3.1 Potential Construction-Related Impacts

This analysis addresses seven different impacts that the construction of light rail can have on local business revenues. Construction can impede access to businesses by foot and by vehicle; it can temporarily consume space for parking; it can lead to temporary, and potentially unexpected, utility shutoffs; increased truck traffic and certain construction activities such as sheet piling can increase ambient noise levels and lead to unpleasant vibrations; road demolition for the laying of

<sup>10</sup> The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. See <http://www.census.gov/eos/www/naics/> for additional information on how the codes classify businesses.

tracks can increase the amounts of dust and dirt in the air; and the construction vehicles and temporary fencing of the work site can impede business visibility.

### **3.1.1 Impacts to Pedestrian Access**

Impediments to pedestrian access will occur mainly at the beginning of the construction period within each phase, when one side of the road is demolished to build new sidewalks and roadway. During this period, pedestrians will need to access the building from side streets or use temporary sidewalks created by the contractor.

### **3.1.2 Impacts to Vehicle Access**

Restrictions to vehicle access will also occur mainly at the beginning of the construction period within each phase, when one side of the road is demolished to build new sidewalks and roadway. Construction can impact vehicular access to businesses in two ways: it can increase congestion on the roadway and block access to entryways. Increased congestion on the roadway can lead to potential customers avoiding the location, effectively reducing traffic to the business, and congestion can also serve to block access, as it becomes difficult to turn in or out of the building's parking lot. Access can also be blocked if roadways or intersections are closed for a length of time. These effects can be more severe if the customers are uninformed of the situation and are unexpectedly unable to access a business from the direction they are approaching, potentially causing them to turn around and take their business elsewhere.

In addition to the impact to customers, constraints on vehicle access also hinder delivery of goods to the stores and restaurants, which can be further hampered by roadway congestion. Impacts to vehicle access may cause businesses to reduce or relocate services during the period of roadway reconstruction. Businesses that rely on pick-ups and deliveries at specific times may be affected by traffic conditions along the roadway. Most office buildings along the CCLRT corridor have parking lots accessible by side streets and can alert their employees and clients to the need to change their route to work for the construction period.

### **3.1.3 Impacts on Parking**

Parking along the corridor alignment will be lost during construction due to roadway reconstruction, and side street parking may be impacted on days when intersections are closed for construction activities. The effects of this temporary loss of parking may impact smaller establishments without access to off-street parking more than businesses that have off-street parking lots.

### **3.1.4 Impacts due to Utility Shutoffs**

Business impacts due to utility shutoffs usually have a fairly short duration and can be scheduled around business hours. Utilities located along the corridor include gas, water, electricity, and internet service, and all will need to be relocated during at least one phase of the project. There are approximately four hotels and bed and breakfasts adjacent to the alignment, all of which potentially need access to at least water and electricity 24 hours a day. Additionally, restaurants and food stores would need advanced warning of shutoffs to ensure adequate food storage and

safety measures are put in place, and the loss of power or water could impact personal care services and manufacturers. Professional services businesses tend to keep regular business hours, so that utility shutoffs could be adjusted to minimize impacts.

### **3.1.5 Impacts due to Noise and Vibrations**

Noise and vibrations from construction and truck traffic can create an unpleasant shopping environment during the duration of construction and could impact business revenues. These impacts likely will be more significant during the beginning of the construction phase, when dirt and debris from demolition are removed and replaced with new materials. Because University Avenue is a major truck route within St. Paul, the additional construction trucks will not have as great an impact as they would traveling on a residential street. Additionally, the noise from the construction site and from any traffic congestion resulting from the site can lead retail shoppers to go elsewhere until the construction is finished.

### **3.1.6 Impacts Due to Dust and Dirt**

Reconstructing the road and sidewalks will generate a lot of dirt and dust, not all of which will stay inside the construction site. The need to clean this dust will negatively impact businesses, particularly car dealerships whose goods are stored out in the open. The dirt and dust may also necessitate more window cleaning and mopping or sweeping as it is tracked in by customers, and will impact possibilities for outdoor dining during the summer months. Because most dust is generated while construction work is actually occurring, it should be confined to daylight hours unless it is disturbed by the wind at night.

### **3.1.7 Visual Impacts**

Construction of temporary fencing and equipment movement and storage may obstruct business signage and may lead customers to believe that businesses have closed during the construction period, leading them to look elsewhere for their business. This problem would largely affect non-appointment based businesses, such as retail shops and many restaurants, as those businesses with appointments can assure their customers that they are operating. It would also reduce the likelihood of impulse decisions to stop in at a particular store or personal care service place, such as a nail salon.

## **3.2 Economic Impacts**

No studies have directly tied the impacts qualitatively described to quantitative estimates of sales revenue losses. As described in the methodology section, the potential for sales revenue losses was calculated using information from the literature on actual losses during construction projects. Baseline revenue figures are from the U-Plan Dataset. There have been some new businesses and some closures since that measurement, and refined data is currently not available. In the absence of substantive data available to assess loss of revenue directly applicable to construction-related environmental impacts on a light rail transit project in an urban setting, this analysis utilized previously published studies as the framework for defining the potential loss of revenue for the corridor with an understanding that the assessment is an estimation at best.

For small businesses under \$2 million in annual sales revenues, the upper bound average percentage revenue loss is estimated to be 2.5%. This estimate is derived from averaging revenue-weighted potential losses across all business types. All small businesses in the corridor were assigned to the impact categories as discussed in the Methodology section. The revenues from each were multiplied by the percentage impacts from De Solminihac and Harrison (1993). The resulting revenue loss estimates were summed and divided by the total revenues from all small businesses in the corridor, yielding the upper bound average percentage loss of 2.5%. As noted in the Methodology section, the lower bound of average impacts is predicted to be no average loss. This range of potential average losses to small businesses of 0 to 2.5% of revenue adds up all of the losses and gains in revenues that might result from the construction disruption and spending. Changes in sales revenues to individual businesses could fall above or below this range. Some businesses that sell to the construction workers and companies will likely benefit with higher revenues during construction. Some businesses that experience disruption but do not attract business from the construction spending may see their revenues decline. For instance, clothing stores that sell work clothes appropriate to construction workers may see their revenues increase, while the shop that sells formal wear may lose business to similar stores unaffected by construction.

## 4.0 Conclusion

While this technical analysis examined impacts on business revenues along the Central Corridor resulting from the construction of the Central Corridor Light Rail Project, the analysis presented in this report is not a conclusive statement on the potential loss of revenue for the businesses along the CCLRT alignment. As described in the Methodology section, quantifying the amount of lost business revenue in the absence of future global and local economic factors and historical context is an inconclusive analysis to undertake for project-level analysis. However, given the limitation of available data, the analysis describes a range of potential impacts both in terms of qualitative assessments of potential impacts (through an EIS review of analogous transit projects in metro areas) and estimates of sales revenue impacts of construction (by developing a corresponding classification system utilized by previously published studies approximately analogous to the CCLRT project).

Over the course of the project, businesses adjacent to the alignment are likely to experience potential impacts on revenues from construction, including issues with pedestrian access, vehicle access, parking, utility shut-offs, noise and vibrations, dust and dirt, and visual impacts. These effects will be phased over the course of the project, with construction extending from March 2011 to November 2012. During that time, while any individual business has the potential to experience loss business revenues during the construction period, the studies indicate that business that include general merchandise, food stores, automotive outlets, and home furnishings stores are more likely to experience greater sales revenue losses due to construction, as well as other economic factors. This estimate of impacts is subject to significant uncertainty, including:

- Limited published research on the sales revenue impacts of construction on businesses caused reliance on a single study for the upper bound, which addresses impacts of a primarily highway project going through neighborhoods with a different mix of businesses than the Central Corridor.

- The statistical analysis in that study concluded that there were no sales revenue impacts for building materials, clothing, restaurants, drug stores, liquor stores, and “miscellaneous businesses”. Consequently, it is likely that there were average sales revenue impacts that were sufficiently small that the study could not detect them, and some businesses in these categories gained revenue while other businesses lost revenue.

Given this uncertainty, it is likely that there will be businesses with sales revenue losses other than those identified as being impacted. In some cases, the losses may be significant, since statistical methods provide average results for a group, rather than exact predictions for individual businesses. At the same time, there are likely to be businesses that experience increased revenues as a result of construction spending during the project. Based on the level of aggregation and uncertainty associated with the studies on which this analysis relies, there is no way to predict what any one business will experience during the construction project. This analysis provides estimates of average effects for broad categories of businesses, and applies these estimates to the small businesses in the corridor to yield a range of average impacts on the small businesses of no impact to 2.5% loss of revenue during the construction period.